National Institute of Environmental Health Sciences

A decision support tool to compare waterborne and foodborne infection and/or illness risks associated with climate change

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Abstract:

Climate change may impact waterborne and foodborne infectious disease, but to what extent is uncertain. Estimating climate-change-associated relative infection risks from exposure to viruses, bacteria, or parasites in water or food is critical for guiding adaptation measures. We present a computational tool for strategic decision making that describes the behavior of pathogens using location-specific input data under current and projected climate conditions. Pathogen-pathway combinations are available for exposure to norovirus, Campylobacter, Cryptosporidium, and noncholera Vibrio species via drinking water, bathing water, oysters, or chicken fillets. Infection risk outcomes generated by the tool under current climate conditions correspond with those published in the literature. The tool demonstrates that increasing temperatures lead to increasing risks for infection with Campylobacter from consuming raw/undercooked chicken fillet and for Vibrio from water exposure. Increasing frequencies of drought generally lead to an elevated infection risk of exposure to persistent pathogens such as norovirus and Cryptosporidium, but decreasing risk of exposure to rapidly inactivating pathogens, like Campylobacter. The opposite is the case with increasing annual precipitation; an upsurge of heavy rainfall events leads to more peaks in infection risks in all cases. The interdisciplinary tool presented here can be used to guide climate change adaptation strategies focused on infectious diseases.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Other Climate Scenario

Other Climate Scenario: author defined scenarios

Early Warning System:

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

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Exposure :

weather or climate related pathway by which climate change affects health

Food/Water Quality, Food/Water Quality, Precipitation, Temperature

Food/Water Quality: Pathogen, Pathogen

Temperature: Fluctuations

Geographic Feature:

resource focuses on specific type of geography

Freshwater

Geographic Location:

resource focuses on specific location

Global or Unspecified

Health Impact:

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Foodborne/Waterborne Disease

Foodborne/Waterborne Disease: Campylobacteriosis, Cryptosporidiosis, Norovirus, Vibrioses

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology:

type of model used or methodology development is a focus of resource

Outcome Change Prediction

Resource Type:

format or standard characteristic of resource

Research Article, Research Article

Timescale:

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

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